EVALUATION REPORT

TECHNOLOGY FOR ALL AMERICANS PROJECT PHASE I

October 25, 1996

EVALUATION REPORT

FOR THE

TECHNOLOGY FOR ALL AMERICANS PROJECT

PHASE I

By

Jill F. Russell

and

Jack R. Frymier

October 25, 1996

Phi Delta Kappa, International

Bloomington, Indiana

TABLE OF CONTENTS

	Page Number
Introduction	1
Review of Methodology	3
Findings/Results	10
• Project Activities	11
• Survey Results	13
• Observation Data	21
• Interviews	40
• Reflections on the Issues of Consensus and the Nature of the Discipline	46
• Review of Document Progression Over Time	55
• Review of the Final Document by Key Audiences	57
• Answers to the Evaluation Questions	58
Conclusions	64
Appendices	66
• Survey Instrumentation	67
• Survey Comments	70
• Review and Comment by Key Audiences	89

INTRODUCTION

This report describes the results of the evaluation of the Technology for All Americans Project, Phase I. In addition to providing a brief description of the project being evaluated, this report includes a description of the evaluation methodology, findings, and conclusions.

Project Description

The Technology for All Americans Project was a multi-year effort funded by the National Aeronautics and Space Association (NASA) and the National Science Foundation (NSF). It began September 1994 and concluded September 1996. The project was conceptualized as a means to the development of a "long term vision for what should be the intellectual domain of technology education." Phase I culminated in a publication presenting the "rationale and structure" for technology education. In addition to clarifying the intellectual domain of technology education, this document was designed to serve as the foundation for standards for technology education in grades kindergarten through twelve. Phase II will carry on the work of development through consensus and validation of:

> standards for curriculum content in technology education for all students, with regard to background, future aspirations, and prior interest in technology at the following grade levels: k-4, 5-8, and 9-12. A model will be created for the assessment and evaluation of this task... Included within the standards will be all aspects of technology as well as the relationships with other allied disciplines such as science, mathematics and engineering.

An important aspect of the Technology for All Americans Project has been the focus on input and consensus from practitioners and scholars in the field of technology, as well as the involvement of professionals from other fields such as math education, science, and

engineering. There has been much effort to have persons from all across the country review the document as it developed and offer reactions and suggestions for improvement. This took place through invitational regional conferences, presentations at professional meetings, communications to the membership of the International Technology Education Association, and World Wide Web access. Much of the energy of the project has gone into the process of soliciting and incorporating feedback from multiple constituency groups.

The Technology for All Americans project is administered by the International Technology Education Association (ITEA). The project director is Dr. William Dugger, Jr. The project staff is housed in Blacksburg, Virginia. A National Commission for Technology Education was formed to oversee the work of the project. The commission includes representatives from a number of disciplines and a variety of types of organizations. A Writing Team assisted with the actual development of the document.

A summary statement depicting the purpose of the Technology for all Americans Project, Phase I could be:

> The goal of the project is to a develop, publish, and disseminate a document presenting a rationale and structure for technology education which reflects dialogue and consensus, and which sets the stage for development of standards for technology education.

REVIEW OF METHODOLOGY

The evaluation was conducted by the authors of this report, under the auspices of Phi Delta Kappa, International, a professional organization in education. It was an external evaluation. The evaluation was designed to provide both formative and summative information. It served several purposes:

- provision of information to assist with the process of the project and with the product development;
- provision of data at the conclusion of the project which addressed the extent to which specified goals were accomplished; and
- accountability to the funding source.

The various audiences for the evaluation were assumed to be:

- the Technology for All Americans project staff,
- the ITEA staff, and
- the funding agencies -- NSF and NASA.

It was also assumed the stakeholders of the project, thus of the evaluation, include: membership of the ITEA; technology educators and others in k-12 education; professional preparation faculty nationwide; and students, parents, citizens, employers, and community leaders across the country.

The evaluation was planned to address the following questions:

- How have participants involved in the review of the drafts of the rationale and structure document viewed:
  - their understanding of the task at hand?
  - their opportunity for input?
  - the general process of consensus-building as a means to developing the document?
- Have those involved in the project gained an understanding of the issues within technology education and the role of technology education within the broader k-12 curriculum?
- Does the resultant document reflect:
  - consensus?
  - the range of opinions offered throughout the process?
  - reformist and essentialist perspectives?
  - the best thinking of the profession?
- Has the project accomplished what it set out to do, in the manner specified in the original plan?
- To what extent has the project validated the need for further work in standards development for technology education?

The evaluation made use of the following sources of information:

- project staff,

- members of the National Commission and Writing Team,
- participants of the various meetings held across the country, and
- various documents produced through the project.

The data collection methods included:

- interviews of staff, and the National Commission and Writing Team members,
- evaluation/feedback surveys administered at the various meetings,
- observation and participation in various meetings, and
- review of documents (both preliminary and final "Rationale and Structure" documents, as well as other project documents).

Data analysis was conducted as follows:

- The interview and observation data were synthesized and recurring themes identified. Those themes were compared with the project's proposed processes and goals.
- Survey data were tabulated and frequencies were calculated. Responses to open-ended questions were organized by item and reviewed to identify most common types of responses and the range of responses.
- The review of documents entailed examination of monthly project reports and publicity materials and comparison of the various drafts and final version of the "Rationale and Structure" document with regard to content and emphasis.

Table 1 summarizes the relationship between the evaluation questions, information needed, data sources, data collection, and data analysis. It is followed by the original Management Plan for the evaluation.

Table 1

Relationship Between Evaluation Questions, Data Sources Data Collection, and Data Analysis

Evaluation Question	Needed Information	Source	Data Collection	Data Analysis
1) How have participants involved in the review of the draft of the rationale and structure document viewed: - their understanding of the task at hand? - their opportunity for input? - the general process of consensus building as a means to future standards development?	1.1 Meeting participants' views on specified subjects.	Meeting participants.	Evaluation/feedback questionnaires at meetings. Interviews.	Tabulation of quantitative data and calculation of frequencies. Compilation of open-ended responses.
	1.2 Evaluator views on specified subjects.	Evaluator.	Observation.	Observation notes reviewed for recurrent themes.
2) How have those involved in the project learned or gained in understanding of the issues within technology education and the role of technology education within the K-12 curriculum?	2.1. Meeting participants' views on specified subjects.	Meeting participants.	Evaluation/feedback questionnaires at meetings. Interviews.	Tabulation of quantitative data and calculation of frequencies. Compilation of open-ended responses
	2.2 Evaluator views on specified subjects.	Evaluator.	Observation.	Observation notes reviewed for recurrent themes.

Evaluation Question	Needed Information	Source	Data Collection	Data Analysis
3) Does the resultant document reflect: - consensus? - range of opinions? - reformist and essentialist perspectives? - diversity issues? - best thinking?	3.1 Documents 3.2 A point of comparison.	The project. Data gathered through meeting processes and through previously specified questionnaires, interviews, and observation.	Process used by meeting planners to officially collect reactions to draft documents.	Comparing actual document to sampling as processed data and data from evaulation input.
4) Has the project accomplished what it set out to accomplish?	4.1 Original plans. 4.2 Actual accomplishments.	Proposal Project Director's report to the National Commission and funding agencies.	Already have. Receive as part of regular mailings or will request.	Comparing actual to intended and identifying any discrepancies.
5) To what extent has the project validated the need for further work in standards development?	5.1 Views of meeting participants.	Meeting participants.	Questionnaires Interviews Observations (Specified previously.)	Specified previously.

Management Plan

Activities	Timeline	Personnel	Resources Required
1) Review proposal and materials.	Apr-May 95	Russell/Frymier	Materials provided by project
2) Develop evaluation design.	Draft Apr-May 95 Final July 95	Russell/Frymier, NC, & project staff	N/A
3) Develop questionnaire instrumentation.	Draft June 95 Final July 95	Russell/Frymier, NC, & project staff	N/A
4) Develop inter-view/observation protocol.	Draft June 95 Final July 95	Russell/Frymier, NC, & project staff	N/A
5) Arrange for data collection.	July 95	Russell/Frymier, NC, & project staff	Printing assumed by evaluators
6) Attend select meetings.	Aug-Dec 95	Russell/Frymier	Travel assumed by evaluators
7) Review documents.	June 95-Aug 96	Russell/Frymier	Documents provided by project
8) Analyze and interpret data.	Initial May-July 95; final Aug-Sept 96	Russell/Frymier	Data analysis
9) Prepare reports.	Aug-Sept 96	Russell/Frymier	N/A

FINDINGS/RESULTS

The findings of this evaluation are presented preliminarily according to the data collection method. They are then presented according to each of the evaluation questions outlined in the methodology section of this report.

The data collection methods around which findings are organized are:

- review of project activities (through project documentation and direct observation),
- survey of meeting participants,
- observation and interviews,
- reflection on assumptions and process,
- the evaluators' review of various versions of the Rationale and Structure document as it evolved over time, and
- a review of the final document by key audiences.

Project Activities

A review of monthly progress reports prepared by the project staff to update commission members indicated the following activities. In most cases, the fact that these activities did take place has also been confirmed by the evaluators.

- project staff were employed and an office was established,
- the National Commission was designated and met throughout the time period of the project,
- the Writing Team was identified and did its assigned work,
- publicity materials were prepared and dissemination took place,
- workshops associated with NASA and various professional groups including ITEA were conducted,
- research on other national standards projects was undertaken and summarized,
- input from many parties was solicited in a comprehensive and structured manner,
- the input was used to revise the "Rationale and Structure" document,
- a proposal for Phase II was prepared and submitted,
- extensive communications took place with individuals who were responsible for technology education in other countries,
- plans for continuing with the standards development process were formulated, and
- the "Rationale and Structure" document was published and disseminated.

With regard to completion of the proposed tasks in accordance to the original timeline, the

following observations are offered:

- as noted in the mid-phase evaluation summary, the schedule of meetings left little time for revision of the document in progress, and
- the project did request an extension during the spring of 1996 to complete the project.

The extension was granted and the project was completed according to the revised schedule. The proposed activities took place and the "Rationale and Structure" document was published in September of 1996.

Survey Results

Surveys were administered to those attending Technology for All Americans workshops in the Summer and Fall of 1995. Participants were invited from the following types of groups: technology education teachers, math and science teachers, technology education supervisors, and teacher educators. The purpose of the workshops was to review the document as it had been developed to that point, suggest needed changes, and discuss issues regarding standards development. The reader should note that these surveys were administered fairly early in the development process. Many of the dissatisfactions noted here were addressed at a later point.

Survey results are presented in the following order: demographics of respondents; and purpose, process, and document related issues.

Demographics:

A total of 291 people who attended 13 workshops across the country completed the survey instrument. Everyone did not respond to every item, but the frequencies and other data provided are for those respondents to the specified item.

The average number of respondents per workshop was 22. The occupation of the participants are listed below in descending order:

- Middle level teacher (69)

- Senior high teacher (69)
- 4 year College/university teacher (45)
- Curriculum specialist (34)
- Elementary teacher (17)
- "Other" administrators (16)
- "Other" teachers (9)
- Government/agency representatives (7)
- Education Association representatives (7)
- Central office administrators (5)
- "Other" non-academic representatives (4)
- 2 year College teachers (4)
- Business/industry representatives (3)
- Principals (2)

Overall, three-fourths of the respondents indicated their role to be a "teacher" at some level.

The subject matter interest of the respondents was categorized as follows:

- Technology (222)
- Science (12)
- Mathematics (9)
- "Other" (9)
- Vocational (8)
- Humanities (2)

- Engineering (1)

The gender distribution was 82% male and 18% female. The ethnicity distribution was 94% Caucasian and 6% all others, including African American, Latino/Hispanic, Native American, and Asian/Pacific Islander. The age distribution was as follows:

- 18-25 year olds 1%
- 26-35 year olds 14%
- 36-45 year olds 36%
- 46-55 year olds 38%
- over 55 11%

Purpose and Understanding Issues:

There were three items on the survey form which spoke to purpose and understanding issues. The responses to those items (numbered 1, 4, and 5 on the instrument) follows.

1) Do you think you understand what the Technology for All Americans Project is all about?

Yes	88.5%
Somewhat	11.2%
No	.4%

4) Have you learned more about technology education as a result of participating at this meeting?

Yes, a great deal	23.4%
Yes, somewhat	60.4%
No, very little	16.2%

5) Do you think there is a need for technology education standards to be developed for schools?

Yes	100%

Process Issues:

Items 2, 3, 6 on the survey instrument addressed process issues.

2) To what extent did you feel comfortable offering your opinions at this meeting?

Very	89.2%
Somewhat	10.8%
Not	0.0%

3) Do you think the process of soliciting input from participants at this meeting will be effective in helping the working team develop the "rationale and structure" for technology education?

Yes	82.5%
Somewhat	16.0%
No	1.4%

6) Do you think this meeting provided a good forum for discussion of the following issue: What should students know and be able to do with regard to technology?

Yes	85.0%
No	15.0%

Document Issues:

The survey also asked for input of participants with regard to the document itself as it existed at that point in time. Item 7 requested a yes/no response to ten sub-items which might be considered criteria for evaluating the document. Items 8, 9, and 10 were open-ended in format.

7) Do you think the document that you reviewed is:

	Yes	No
Comprehensive in scope	74.8%	25.2%
Logical	75.3%	24.7%
Technically accurate, correct	64.6%	35.3%
Clearly written	20.5%	79.5%
Useful	85.6%	14.4%
Acceptable to most people	52.4%	47.6%
Motivating and compelling	34.0%	66.0%
Illustrated with helpful examples	67.4%	32.6%
Internally consistent	28.2%	71.8%
Balanced	55.9%	44.1%

8) What do you think every American should know about technology that is not already addressed in the document?

A summary listing representative of the range of responses follows. A complete listing of comments can be found in the appendix.

- the relationship to careers, work, and the economy
- the connection to the teaching of technology
- the skills gained from technology education

- the technological process
- the relationship to, and differences between technology education, the other disciplines and instructional technology
- the systems concept

9) Are there any values you think every American should hold about technology that are not addressed in the document?

A representative listing of responses follows, with the full listing in the appendix.

- need to be cautious with relation to values
- the ramifications of technology
- ethics
- responsible choices and behaviors

10) Are there any things that every American should be able to do with technology that are not addressed in the document?

A representative listing of responses follows, with the full listing in the appendix.

- use of technology to solve problems
- more informed choices related to technology
- familiarity with various technologies
- awareness of relationships to jobs

- application of technologies

Observation Data

The evaluators attended six meetings. General observations are offered by the evaluators for three of the meetings, and more detailed notes are offered for the three remaining. The six meetings attended were:

- the Blacksburg meeting of the Writing Team on June 2-4, 1995;
- the Dearborn meeting of the National Commission and Writing Team in June 23-25, 1995;
- The NASA workshop at Langley Research Center in Hampton, Virginia on August 2-3, 1995;
- the NASA workshop in Cleveland at the Lewis Research Center August 14-15, 1995;
- the Technology for All Americans session at the Mississippi Valley Industrial Teacher Education meeting in Chicago, Illinois on November 10-11, 1995; and
- the International Technology Education Association Annual Conference in Phoenix, March 31- April 2, 1996.

Observations by the evaluators from those meetings follow.

Observations from the Blacksburg Meeting

June 2-3, 1995

The Blacksburg Meeting brought together the Writing Team members and selected project staff. About 20 were in attendance. There was excellent discussion and analysis of the issues. The evaluator acted at times in a role providing feedback on process aspects of the meeting. This was well received.

Observations from the Dearborn Meeting

June 23-25, 1995

This was a planning meeting involving project staff, National Commission members, and the Writing Team. Nineteen individuals were present including the two evaluators. The meeting was opened with an update on the status of the project. Plans for the coming months were also discussed. A review of the standards development process and final outcomes for the other disciplines was provided. The point was made that technology education has been evolving and changing so much in comparison to the more established subject areas, that a "rationale and structure" statement was needed for technology education prior to moving directly to standards.

An update was provided by the chair of the Writing Team with regard to that group's progress. They had decided originally that two separate documents (a more scholarly paper

and a public relations piece) were needed, but had since changed their minds and gone back to one document. The process for revising the document on the basis of the Dearborn meeting and the NASA meetings was addressed.

In small groups the participants went through the document section by section. Some of the major issues included a felt need for more emphasis upon:

- the technology process as a way for the human mind to develop
- exciting examples
- a clear definition of technology, right up front
- audience specification -- who the document is intended for
- distinguishing between technology education and other disciplines

Discussion was summarized and each individual also submitted their own reaction forms for each section.

The total group was reconvened and the ideas from the small group were shared. There was an emphasis on getting all the ideas expressed at this point, without trying to achieve consensus too early. The organizing structure of the document was discussed extensively. The issue of technology education as a discipline was debated.

The third day the project staff presented their views as to what the group had concluded. There were 27 points. One by one the items were offered and reaction as to consensus was discussed. The items were voted upon where necessary. The group then discussed how the

changes might be made in the context of the upcoming mix of meetings across the country.

The evaluators were asked to present the plans for the project's evaluation. That information was provided and input on any perceived need for change in the evaluation plan was requested. No major suggestions for change were offered.

The issue of working as a team while holding individual perspectives was discussed as a closing item. The groups seemed to feel comfortable with this approach. The meeting was adjourned and photos were taken for use in publicity materials.

Observations from the Langley Workshop

August 2-3, 1995

This was just the second of the series of NASA workshops. There were about 20 people in attendance. The meeting seemed to bog down early in that lots of time was wasted in dealing with very small editorial-type issues. Participants were reviewing the document one word or one sentence at a time. After more explicit instructions were provided the dialogue seemed to rise to a higher level.

Observations from the Cleveland Workshop

August 14-15, 1995

Following are the observations by one of the evaluators attending the NASA workshop of the Technology for All Americans Project held at the Lewis Research Center, Cleveland, OH, on August 14, 1995.

Participation. The expected attendance was 34. There were 33 present. Neither of those counts include the project director or the evaluator. There were four females, no apparent racial minorities, two with slight disabilities. There were teachers, supervisors, state supervisors, and teacher educators in attendance. Two "big names" in the field were present. Several people who were officers in the International Technology Education Association, at various levels, were present. Multiple states were represented, as was intended.

Process. The day began with the Project Director explaining the purpose of the meeting: to obtain input on the Rationale and Structure document. He indicated that this was one of many meetings nationwide; eight states had been invited to participate at the meeting, and there had been a nomination process for selection of participants. He also told those present that this was the third or fourth draft of the document, and that three to four more iterations were expected yet this fall. The document was described as being fluid, dynamic. The Project Director invited their input.

Next, the project itself was explained, including the funding sources, timeline, process being used, the staff, and the structure. In addition, the relation of this effort to past efforts of the profession were discussed, and a comparison of this "standards" effort to those underway within other subject areas was provided. The goal of this project as well as the goals hoped for in Phase II were both delineated. Clarification of the distinctions between educational technology and technology education, and between technology and science, were offered.

It was explained that the meeting sought individual input via written notes on the draft document and verbal comments, and small group conclusions following discussion. Consensus was defined as "51% agreement or greater." A question was raised about "minority reports." The project director said they would be accepted if offered.

The connections between the Technology for All Americans project and the Goals 2000 initiative were made, and the expected benefits of standards for students, the profession, and the school districts were discussed. The definition of standards as indices of quality that can be measured was shared, but the point was made that there is no preconceived notion of what format the standards will take when they are eventually developed.

Participants were grouped according to a pre-arranged numbering system on the nametags, and the directions for the small group activities were reviewed (as provided in a handout). If a group could not come to consensus, they were instructed to indicate so on their group recording sheet and identify the issue at hand. It was pointed out that the entire document

would be on World Wide Web in October. Input from that process would be tallied also. The point was made that, if a section was deemed to be inadequate, information on "how and why" it was inadequate was desired.

The small groups met together for several hours before lunch and several more hours after lunch. If they completed the document review early, there were several additional tasks they were requested to complete. For example, groups were requested to look at the currently proposed graphic model depicting technology education, and make suggestions for change or offer an entirely new approach.

Toward the end of the day, the participants were asked to complete the evaluation form. Then they reported their conclusions to the entire group.

Comments Made by Participants in One Small Group. The evaluator joined one small group and stayed with that group the entire time. She participated in the discussions and occasionally provided clarification on some questions about the project. Following is a sampling of the comments made in this small group:

- Who is the audience? Its unclear.
- The preface is too conversational in tone.
- The document needs to open the door to allow technology to be considered an essential part of the school curriculum (which the person who made the comment thought had not been accomplished in this draft).

- This document will probably be the guidelines for the next 10-15 years.
- The definition of technology is there, and is adequate, but is difficult to find; it should stand out.
- The document needs to provide clarification (as the Project Director had done at this meeting) about distinctions between educational technology and other areas. It needs to capture and clarify the differences, define the field.
- The document should challenge people, be forward thinking, and communicate a need for change.
- "Technology literacy" is not a clearly defined concept that has achieved wide acceptance in the profession, yet the document presumes a consensus has been attained.
- The document uses a great deal of jargon, and unnecessary "big" words. It should be assumed the reader is a novice with regard to technology education.
- There were too many examples, it distracted from the flow of the narrative/logic.
- Only white, male inventors were named as examples. Others are needed.
- The document should provide the vision, describe the ideal technology education program (both as a stand alone and integrated throughout the curriculum), and discuss instructional delivery.

When asked at the end of the day about their overall, general reactions to the document, the following points were offered:

- It is not what is written, but how its written that is the problem.
- Would like to see it again before its finalized.
- Would this impress principals and superintendents? Not as it is now.
- Would the reader get from this that technology should be a core, required subject? Not as it is.
- It needs to be written more for a non-technology education audience.
- It is kind of difficult reading. It needs to be more user-friendly.

Other Data Gathered. At the beginning of the session, the evaluator invited all present to feel free to share any opinions about the project or document. One participant approached the evaluator about mid-way through the small group, morning session. This individual commented that the time allotted to work through the document was too limited. He said a major flaw in the process was the time constraint. They were doing a good job, but one day was not enough to dissect and improve a document of such importance.

Another participant commented to the evaluator that the Project Director has always done excellent work. He assured me the final result would be a good product.

Yet another participant told the evaluator that some people may be counting too much on this document. That is they may be expecting more (the transformation of the field) than is

realistically possible through a single document.

The evaluator also conducted a quick, visual review of the evaluation forms. They were to be tallied later, but the general impressions were:

- The vast majority indicated they felt they understood the Technology for All Americans project, felt comfortable offering their opinions, felt they learned more about technology education as a result of participating in the meeting, and think the process of soliciting input from participants will be effective for development of the document.
- There was unanimous agreement that technology standards should be developed for schools.
- About one-fourth of the participants felt the meeting had not provided a good forum for discussion of what students should be able to know and do regarding technology, but the other three-fourths felt that it had provided a good forum.
- When asked if the document was comprehensive, logical, accurate, clear, useful, acceptable, motivating, internally consistent, balanced, and illustrated with helpful examples -- slightly more responded "no" than "yes."

Observations by the Evaluator. As the meeting proceeded, several thoughts came to mind to the evaluator:

- After the extensive series of meetings throughout the fall, there will only be

three months to finalize the document. With all the data (input from participants and World Wide Web viewers) that needs to be reviewed, this will make the crafting of the final document a very rushed affair. There may be a need for a professional writer to take over in December/January to make sure the document is consistent in style and readability.

- As the evaluator thought of the earlier meeting she had attended in Dearborn with the National Commission and the Writing Team, it was obvious that some of the decisions made at the previous meeting, were being recommended for reversal by this group. For example, the National Commission had decided not to identify specifically the intended audience for the document, but the group in Cleveland wanted that information included. Obviously both groups cannot be satisfied.

Observations from the Chicago Session

November 10-11, 1995

This was a meeting of the Mississippi Valley Industrial Teacher Education group in Lisle, Illinois (a suburb of Chicago). The Technology for All Americans Project session came at the end of the regular annual conference of this group. It also coincided with the first snowfall of the season, and many people were leaving or very conscious of the need to begin their travels home. Because of those two factors, the issues were never given the serious consideration as had happened at other meetings. The people present were good

and thoughtful people, many people were just anxious to leave.

Observations and Conversations from the ITEA Annual Conference -- March 30 - April 2, 1996

Following are notes from observations and conversations at the ITEA Annual Conference, where there were several sessions regarding the Technology for All Americans Project.

Presentation to State Supervisors (Saturday, 1:30 p.m.). This session was well attended. The Project Director presented the background, history, funding, consensus process, conclusions to date regarding rationale and structure, and indicated that the Writing Team would be meeting that evening for further deliberations. He also outlined the request for an extension and the request for Phase II funding. He described what the Phase II Project included. He provided a flyer and copies of his overheads. At some point during this meeting, the Project Director commented that the project staff probably should have sponsored or participated in fewer meetings (through the summer and fall of 95), and left more time for working on the document itself.

After the meeting I asked the Project Director what he felt the reaction of the state supervisors to be. He indicated that he thought they were disappointed; that they expected the final document at that presentation, but found instead that it would be a few more months.

At this point I learned the project had only one more day of funding and had not yet received word on the approval of the request for an extension of time to complete the project.

Writing Team Meeting (Saturday, 5 p.m.). The group met more than six hours. There was lively discussion. The Project Director presented an outline of the section which needed the most work (because it had not achieved at least 51% agreement via the meetings and other forms of input). They did come to agreement on the needed issues. Some of the issues which were debated were the same ones debated at the Dearborn meeting almost a year earlier.

General Session Presentation (Sunday, 10:30 a.m.). This meeting was jam-packed. An estimated 90 people filled the room and overflowed into the hallway. The Project Director presented basically the same content as he had to the State Supervisors, but also provided the update from the Writing Team deliberations. Issues that were raised included the following:

- What was the projected target date for completion of the k-12 curriculum standards?
- How likely was funding for Phase II?
- How is this effort different from the Jackson Mill Project?
- Have other organizations reacted to the Rationale and Structure document?
- Is the student association involved with this effort?
- How can we maximize use and impact of this report through the state associations?

- Having standards will be helpful to the change process necessary for the new technology education paradigm to emerge.

There was no questioning or arguments with the basic assumptions or plans that were outlined.

Workshop Meeting (Tuesday, 1:00 p.m.). About 35 participants were in attendance. This was basically the last full day, and it was late in the afternoon. When asked, about two-thirds of the group in attendance had been involved in a consensus meeting or other form of review previously. The Project Director told me prior to the meeting he had included in the presentation the decisions made at the Writing Team meeting, particularly the definition of technology and the structure component. This group would have the chance to react and come to consensus on those issues.

The same basic overview was provided. The Project Director made the comment that the process for soliciting input via the Internet would be useful for the standards process also. This has not been used by any of the other standards development processes. The director also indicated he had talked with people from Great Britain, New Zealand, Australia, and the Netherlands. A participant asked if the project staff were interested in state standards development. The director indicated they were trying to learn from state activities also.

The proposed outline for the Rationale and Structure document was presented (based on the

Writing Team decisions reached a few nights earlier).

The questions were asked: What does "adaptive systems" mean? Are these sections (within Adaptive Systems) weighted equally? The Project Director pointed out that Processes and Knowledge needed to be placed within a context. The Adaptive Systems categories provide that context. He also indicated there had been no weighting, but that could be done at the state level if desired.

There were a number of comments made by participants intended to facilitate effective dissemination.

The Project Director indicated Phase II is planned for 30 months for the k-12 standards, and 30 more for the other three sets of standards. The question was asked: Will these automatically become the NCATE (National Council for the Accreditation of Teacher Education) standards? The Project Director said they would have to be submitted to NCATE for approval. The past standards that had gone to NCATE had come via CCTE. The standards would be in alignment with NCATE, regional accrediting bodies, and NASDAC.

The Workshop portion began. Participants were requested to provide input using much the same process as was used for the NASA meetings.

Topics for input:

- How can various groups be best informed about the Rationale and Structure document?
- What are the projected roadblocks, barriers for endorsement of the Rationale and Structure document?
- What are the issues surrounding nationally-developed standards for technology education (point was made these are not national standards, because we have no national curriculum, but these are nationally developed standards)
- What are the key components to include in the rationale?
- Can we identify strategies to assure that the standards will be used effectively?
- What are the advantages and disadvantages of having nationally developed standards?

There was some confusion about the fact that the Rationale and Structure document would be a separate document from each of the standards documents.

Small groups addressed those questions and reported back.

During casual conversations with one small group, the point was made that the National Professional Standards Board, Vocational Sub-component, is working on standards, and one

of their sections relates to technical education standards.

Suggestions for dissemination included:

- Personal contacts where possible.
- Multi-media would be helpful.
- A five year lag between the Rationale and Structure and the Standards was considered to potentially be a problem.
- Presentation packages for local people to present at state and local conferences would be useful.
- Counselors should be a special target. School board members should also be a special target.
- Serious lobbying needed.
- Don't forget special needs teachers.

The Associate Director concluded that a series of strategies for dissemination and on-going connections to set the stage for the standards will be needed.

The following possible barriers were identified:

- Confusion within the profession as to what Tech Ed is all about.
- Lack of responsiveness to business/industry concerns.
- Confusion outside the ranks as to what technology education means.

The Associate Director said this project has used a very structured process for achieving consensus within technology education, so the Rationale and Structure document can be considered as representative of the views of those in the field. A participant said he did not want to burst the staff's bubble, but there is still lack of consensus within the profession. Programs are called all sorts of different things, and different programs sometimes have the same name. Another said though, that a lot of thought had gone into the outline presented today, and that it would encompass a lot of different approaches. The Associate Director commented that the outline had been developed to be inclusive. Hopefully whatever approach is used in a specific classroom, building, or district; the knowledge and processes could have the same focus, even if the delivery context differed.

With regard to the standards, these points were made:

- There is potential conflict with state standards.
- The standards provide a common direction.
- If the technology education standards can be incorporated into school reform/quality projects, that will help insure implementation.
- Currently technology education is not a national priority. We need to develop a strategy for that to happen. Business/industry endorsements would provide good leverage. Engineering association group endorsements would also be powerful, as would regional and national accrediting associations for high schools.
- It is important to focus on overall economic benefits to the economy of

having these standards in place.

- The terms used in the Rationale and Structure must be well understood (e.g. many people won't understand "Biology Related" adaptive systems).
- The network for the dissemination of the Rationale and Structure document could be the same for the Standards document. However, several years later, much of the information (names, addresses) will be out of date.
- The Listserve needs to be on-going, wide open. That will allow for lots of inexpensive input. The Associate Director indicated however, that he was disappointed in the level of conversation on the Listserve to date, but this will be continued.
- A discussion group process (on the Internet) was suggested also.
- An on-going column/article in the Technology Educator journal would be helpful.
- A concern was pointed out that, by the time the standards come out, in conjunction with the retirement of existing teachers, there may be very few Technology Education teachers remaining.
- It was suggested that university personnel might provide staffing for the project.
- Others said that project personnel must take the time to do the consensus building and involvement correctly.

The Project Director thanked the group for their input. The audience indicated their support for the process and the opportunity for dialogue.

Interviews

A formal interview was conducted with one individual who had attended one of the NASA workshops during the summer of 1995 and is reported here. Several other informal interviews are reported also.

A Conversation With Jane Doe -- 9-7-95

A participant from one of the NASA sessions was interviewed approximately one month after attending the meeting for her region. Prior to attending the meeting she was not aware that she would be asked for an interview. This individual served as chairperson of a math department in a high school in a suburban school district in the mid-west.

Following are the questions and responses. This is not a verbatim accounting of the conversation, but it does summarize the points offered.

What were you expecting when you arrived at the meeting? Was expecting a standards document. Was expecting large and small group discussions about the standards. Was confused when the document arrived and it was not about standards. Once there, a good overview was provided, so she was relieved, as was almost everyone there since they had the same misconception. Had anticipated perhaps 300 people from around the country to be there. Instead it was 20-30 people.

How did you get involved in this effort (invited/selected)? Received a letter in the mail saying had been selected, but not why. Called for clarification. Was told the state department had suggested people representing certain disciplines. Concern was funding for the trip. Had been going to decline, but she also serves on a community 2000 committee which is interested in standards, so asked them for funding and they agreed. When arrived she looked for other representatives from her state, but she was the only one there. It might have been good if there had been some coordination within the state. She was not the only representative of mathematics, however. It was a good mix of university, public school teachers, and supervisors, etc.,. She had a concern though, that the document had probably been developed at the university level, with little input from k-12 people.

When you realized the document was about the rationale and structure for technology education, how did you feel? Felt it was way overdone, inflated for a rationale and structure document. It could have been accomplished in 3-5 pages. There were sections that, although very interesting, took you off track. Do we really need 12 pages to explain why the world is changing? That was an explanation for technology in a changing world, rather than for technology education. In fact, she felt the biggest weakness was the emphasis on technology, rather than technology education. A credit to the process used was the fact that people outside of technology education were involved. Her past experience with the politics of standards setting and community processes gave her a different perspective.

The timing for the meeting seemed good. At first she thought, how can we go through this in one day, but if it had gone longer, it would have become too nit-picky.

Some feel this is a really important document for technology education. How do you feel about it? It is not such an important document. It should just be a preface to the standards. It should be 10-12 pages and set up in a pamphlet type format.

What do you feel are the strengths and weaknesses of the document? Strengths -- excellent examples are provided; excellent phrases are included (e.g. technology will become the separator or the equalizer of the haves and have nots); material at the end was good, but it should have been more central, and been placed earlier in the document.

Weaknesses -- could tell the document was written by different people; talked around the issue of why we need technology education; verbose; needed looked at in term of "hot buttons" which may raise ire of special interest groups; a few ideas may need clarification or reconsideration (e.g. need for re-certifying teachers from other disciplines); lots of references to having technology education being incorporated within the core curriculum -- that is problematic. She thinks technology should be invisible. Wants technology to be used to enhance instruction, not to decorate the curriculum.

Comments on the process -- Very definitely felt that the participants comments were being listened to by the project staff. Felt sorry for project staff at times (because of comments

being made), but it was handled well. Bill Dugger stayed neutral, took everything as very valuable. He was very, very good about that. He also explained well where the process goes next, and about the web-site. She has received a follow up newsletter since attending the meeting. The major weakness with the process was the lack of funding for participants to attend the meetings. Any of the things about the meeting that were not well done, were associated with lack of funding. With that consideration in mind, it was otherwise very well done. A real positive was that the project sent a letter to Jane Doe's superintendent, board president, and principal of her school about her participation.

Do you believe there is a need for technology standards? Yes, I do. But I have also seen within our own district, since we have established standards, that it takes away a little of the teacher's own flexibility. Would like to see some consistency across the state and nation, though. With technology becoming so important, we need standards to help educate. Would hope standards might support cooperation with other areas. That is probably an important goal of this effort.

Will the Rationale and Structure document pave the way to standards? Yes, if they shave it down and don't try to do more than they should with this document. She doesn't remember other disciplines coming out with a prelude document. Who is the audience? If its only technology education people, it will miss the mark. This should have pretty wide distribution to other educators outside the technology education area.

As a math person, what was your reaction to this new way of thinking about technology education? It didn't really surprise me. In dealing with math, there has been very much a link with vocational education. She had seen this coming. She has worked closely with the technology education people in her district. She sees the distinction between educational technology and technology education. Technology education needs to change. Unless they can prove their worth to the future of our children, they may be cut in impending budget reallocations.

Overall comments about the meeting: Overall, it was well organized, a good process, comprehensive, and provided the feedback the project staff needed to hear. The flaw was the lack of funding. She learned a lot about where the field of technology education is going and about problems in the field. Personally she felt it was worthwhile. She felt thanked and appreciated. Conversations were such that she felt everyone there benefitted because of the mix of people.

Comments at the Airport

An individual who had just attended one of the NASA workshops was at the airport at the same time as the evaluator. He is a technology education teacher at the secondary level. His opinions were solicited, and are offered below.

- Some people are counting too much on a single document. It is not realistic to expect that much change based on one document.
- In general the technology education people feel discriminated against. They want to be considered a part of the regular curriculum.

Points Made By the Project Director

- We are seeing regional differences in how the document is perceived. We think this is because technology education is placed in different contexts in different states/regions. For example, California includes technology education within vocational preparation. The midwest is a little conservative, but very professional.

Casual Discussion Points

- There are wide variations in pay for equivalent credentials and experience for technology education teachers. There are big shortages nationally.
- Often the teacher preparation for technology education program also serves people going directly to industry. Industry pays higher.

Reflections on the Issues of

Consensus and the Nature of a Discipline

This section is a reflective discussion on two issues which were very important to the Technology for All Americans Project. It was included in the mid-phase evaluation report, but is repeated here in the knowledge that the issues remain important, and all readers of this final report may not have had access to the mid-phase report.

Observations Regarding the Heart of the Matter

From a careful study of the proposal, and from hours of watching both the National Commission and the Writing Team grapple with various conceptualizations and aspects of technology, two things seem paramount. They are both at the heart of what this project is all about: the processes and realities that relate to achieving consensus among informed professionals, and the idea of technology education as a discipline within the schools. What is also evident, after careful consideration, is that these two phenomena cannot be described or thought about separately within this project. They are inextricably intertwined, and they must be dealt with in terms of their relationships with one another.

What follows is a beginning effort to delineate some of the factors that affect any consideration of what "consensus" and "discipline" really mean in this project. The realities of both of these phenomena are involved, but so are the realities of human cognition and aspiration, and these cannot be ignored.

We begin this discussion with an assumption that is based on extensive observation of the people in this project at work: there is nothing but good will, seriousness of purpose, first-rate scholarship, commitment to contribute, and readiness to hear other people out that characterizes the nature of every discussion we have observed. There is absolutely no rancor, no bitterness, no struggle for power or recognition or control. These are good people, working diligently and creatively to wrest ideas from the cauldron of human experience and human thought. Not a single instance of base motives was manifest; not a single instance of deception, inflexibility, or unwillingness to look at things from another point of view.

Even so, serious issues have evolved. The issues tend to center around the notions of "consensus" and "discipline," as these two factors have surfaced and been dealt with in this project. In the exploration of these issues that follows, we have tried to articulate the various assumptions and facets of the issues, as we see them, and explore the relationships between the issues in ways that we hope will be helpful. That is our intent, anyway.

We are conscious that the description that follows is rambling and not well organized; that simply indicates the level of our understanding at this point in time. Reflecting on our observations of the discussion conducted by the National Commission and the Writing Team, our best guess is that they have not yet achieved consensus on what either "consensus" or "discipline" mean.

Different dictionaries define the word "consensus" in different ways. One defines it as "unanimity; agreement, especially in opinion." Another defines is as "agreement in opinion; the opinion of all or most of the people consulted."

One problem that has emerged inheres in the notion of "agreement in opinion." In one discussion, for instance, there were various opinions presented about whether to specify the audience in the preface. There probably is no "factually correct" answer to that issue. On another issue, however, there was extensive discussion about "what is a discipline?" and there probably is a "factually correct" response to that question, though the degree of correctness may be such that only opinion can resolve the question anyway. With these thoughts in mind, what follows is our attempt to think though these two issues in various ways.

Both evaluators were intrigued and impressed with the level of effort expended to achieve consensus. Agendas were arranged, meetings were conducted, and specific sequences of activities were accomplished by the project director and two chairs (i.e. National Commission and Writing Team) that encouraged maximum involvement, thoughtful deliberation, and careful review of all reactions and suggestions. The consideration by the Writing Team of ideas that emerged from discussion, the attention to detail that was clearly designed to clarify every issue, and careful recording of every suggestion were all accomplished in ways that were intended to assure that nothing was lost and maximum agreement was obtained. The commitment to consensus was both genuine and laudable.

But when the idea and the ideas of consensus were applied to the phenomenon of "discipline," as that idea was developed in the rationale and structure document, consensus was more difficult to achieve.

One could make the general argument that there is no real consensus about what a discipline is, and if one means "unanimity or complete agreement," that is probably correct. But if one means that there is "fairly widespread agreement" about what a discipline is (say three-fourths of the people who are knowledgeable in that area), there probably is a consensus that might be realized.

The problem is confounded by the fact that the definitions and logical constructs used to describe and elaborate each discipline are also definitions and logical constructs that are not always perfectly clean or consistent, and the definitions employed internally within a discipline are important in differentiating one discipline from another. For example, geography (and most would agree geography is a discipline) uses concepts such as a "large land mass" to define "continent," and elementary school teachers sometimes add the notion of "surrounded by water," but Europe and Asia do not fit those notions precisely. Eurasia is more consistent, but almost all geographers separate Europe from Asia, even though there is no clean physical separation at all.

The effort to differentiate between disciplines is related to the attempt to differentiate within a given discipline. Disciplines are comprised of sub-units that are thought of as being at a

different level than the discipline, and these sub-units are usually subsumed by the higher level. Thus mathematics would be thought of as a discipline, but mathematics includes such sub-units as algebra, geometry, arithmetic or real numbers, and others. And arithmetic or real numbers is comprised of addition, subtraction, multiplication, and division, which are usually described at a lower level, but are actually subsumed by arithmetic.

What emerges in any consideration of the concept of discipline is that differentiation is involved; identifying what a discipline is includes specifying what it is not. It is like drawing a boundary. We assume that mathematics is different from history, and history is different from chemistry, and chemistry is different from sociology, and sociology is different from physics, and physics is different from art, and on and on. Trying to differentiate what technology is from what it is not is part of that task this project has undertaken. It is a difficult task, to say the least.

Another factor that emerged in the discussion revolved around the term "level" as applied to discipline. Two factors seemed evident in those discussions. One factor in the discussions seemed to be concerned with describing different levels for purposes of clarification; the other factor seemed to relate levels to significance or importance (i.e. some levels are higher than and therefore better than lower levels). The discussion about technology being at the same level as science brought confusion when science was stipulated not to be a discipline in the ways that physics, chemistry, and biology are thought to be disciplines.

Most educators' experience with the word "level" in education works against the idea of not attributing significance to the word. Everybody knows that college teaching is not more important that elementary school teaching, but most people still act and assume that college teaching is more important than elementary school teaching. We cannot wash our previous experience with the word away.

Every discipline can be described as consisting of several levels, and each level is generally subsumed by the level above it, thus there is a differentiation of levels, but not of significance. Addition is important in its own right, and a part of arithmetic, but arithmetic is also important in its own right and a part of mathematics.

What seems to emerge from this kind of look at various disciplines suggests that differentiation between disciplines and differentiation of levels within a given discipline are all important, but that such differentiation does not imply greater or lesser significance, whether looked at in vertical or horizontal ways. We are all sensitive to the fact that certain disciplines claim more significance, the hard sciences of physics and chemistry are frequently seen as being purer and more obviously disciplines that the soft sciences such as sociology or economics, but that is a status thing either imputed to and inferred from one position or another. It is undoubtedly correct that those disciplines that are seen as true disciplines are more fully differentiated from other disciplines, and differentiation is also more evident in the vertical organization within those disciplines, too.

The point is, in describing curricula phenomena, it is common to place some entities at one level and other entities at other levels, but the purpose is universally seen as one of clarification rather than attribution, however, the various levels may be labeled (e.g., discipline level, concept level, division level, topic level, field of study level, subject level, etc.).

The actual result of such practices as described above means that there is an imperfect characterization of disciplines, and an imperfect placement of disciplines and their sub-units into a structured relationship. This may be, at least in part, because some disciplines seem to have been conceptualized deductively -- from the top down, so to speak -- from a broad construct to a more specific topic or sub-topics. Other disciplines seem to have evolved inductively, or bottom up, so to speak. Still others seem to have been created as a result of lateral combinations (e.g., bio-chemistry or sociobiology), across fields, while still others have probably evolved as a result of separation within a given field (e.g., botany and zoology from biology).

All of these examples simply underscore the point that academic disciplines are artifact; they have been created by human beings on the basis of experience. If one studies a university catalog, for example, it becomes obvious that the notion of discipline is typically related to the reality of departmental organization within the university, but not perfectly. The departments of history, mathematics, geology, or political science, for example, are thought to be devoted to ideas that are typically described as full-fledged disciplines. A

College of Education, however, would be hard pressed to justify itself as a discipline at all, although college is a higher level than department, and no one would argue that the departments of elementary education or school administration were disciplines, or the athletic department or School of Social Work.

University people work regularly at the task of producing new knowledge, thus new disciplines develop over time, according to how university people do their research, develop their ideas, get approval for new courses, establish new departments, and the like. It is an imperfect, human work, however, and in this world the reality of disciplines emerge and thrive.

The point of this discussion is simply that disciplines are seen as bounded entities, separated from and different from other disciplines, but those boundaries and separation are based partly on reality and partly on arbitrary distinctions that have simply been agreed to by theoreticians and practitioners in the field. But how many theoreticians and practitioners does it take to assure consensus? The answer seems to be "most but not necessarily everyone," thus consensus probably means something like three-quarters to four-fifths of those involved.

Whorf argued that "language shapes behavior," and the language used to describe and define a discipline is the language that members of the National Commission and Writing Team from this project have been working through, thus far to a less than perfect solution.

But great progress has been made. Whether technology is ultimately defined and defended as a discipline is probably less important than that the effort is being initiated to draw boundaries around "technology" in such a way that something will eventually emerge as a bona fide discipline, whether at the level of technology, or lower or higher, as the case may be.

Review of Document Progression Over Time

The Rationale and Structure document went through extensive revisions at least four times. The various drafts included:

- a two document version -- a yellow covered "theoretical" piece dated 5/15/95 coupled with a teal covered "wide audience" version dated 5/16/95,
- a green covered version dated 6/15/96,
- a red covered version dated 7/17/96,
- a gray covered version dated 11/8/96, and
- a version with photos on the cover dated 7/16/96

The final printed version was distributed in September 1996. As the versions are compared in developmental sequence, the following observations can be made: the document went from a highly theoretical piece focused on technology per se and targeted to the technology educator, to a much briefer document targeted more toward policy makers and educational administrators and focusing much more on the teaching of technology. Over time, the document became more practical, more reader-friendly, more applicable to k-12 education.

It is clear from summary data provided by the project staff on the reaction forms completed by the many reviewers of the document at various stages, and the subsequent changes, that the staff were using the feedback as the basis for revisions. For example:

- The teaching of technology which was barely addressed in the early versions, and which was commented on as a need in many meetings, was discussed much more thoroughly in the later version.

- The point that there were few examples of technology associated with women and minorities in the early version, was corrected in the later version.
- The point that "systems" was not addressed sufficiently in early versions, was cause for more attention in the later version.
- The "model" for technology education as depicted in the final document as the "universals of technology" went through many iterations as the document evolved.

The document was revised to reflect input and consensus.

Review of the Final Document by Key Audiences

The project staff conducted a review of the final document. The review included the following groups:

- National Commission Members,
- Individuals who will serve on the Standards Team in Phase II of the project,
- ITEA Board Members, and
- School administrators including superintendents, principals, and others.

A total of 48 out of 62 individuals who were requested to review the document did so. "Review and Comment Forms" were completed and submitted. The tallied results are located in the appendix. The general conclusion is that the document is well received. The audiences agreed (between 82 to 96 percent indicating strongly agree or agree) with each of the following statements:

- the preface is effective,
- a valid rationale for technology and technology literacy are presented,
- a clear framework for the universals of technology is offered,
- the teaching of technology sections provide an appropriate vision,
- the call to action is useful,
- the references and resources are appropriate,
- the overall document is well designed, and
- the overall content is effective.

Answers to the Evaluation Questions

The evaluation was planned to address the five questions which follow. The question is posed in italics, and the related findings then follow each question.

1) ***How have participants involved in the review of the drafts of the rationale and structure document viewed:***

- ***their understanding of the task at hand?***

  The data indicate:

  - The survey showed 88% of respondents felt they understood the task at hand.
  - One early meeting showed some lack of understanding by participants as to their primary role. After instructions were reviewed, however, the group seemed to achieve a better understanding.
  - The individual interviewed in-depth indicated she was confused about the task at first, but understood it after arriving at the NASA meeting she attended.
  - The observation notes include reference to the project staff explaining the task at meetings.

- ***their opportunity for input?***

  The data indicate:

  - The survey showed 89% of respondents felt comfortable offering input at meetings.
  - Observations revealed that the meeting process itself highlighted the

fluid nature of the document.

- The individual interviewed in-depth felt wide involvement of numerous disciplines was a "credit to the process," and that participants were sincerely listened to.
- The project staff encouraged meeting participants to take advantage of the opportunity for input.

- ***the general process of consensus-building as a means to developing the document?***

  The data indicate:

  - The survey showed 82% of respondents said they felt the process was effective to the purpose.
  - The individual interviewed in-depth said the meeting was well organized, comprehensive, and made use of a good process.
  - Observation confirms the fact that the project staff made use of practices which encouraged movement toward consensus.

2) ***Have those involved in the project gained an understanding of the issues within technology education and the role of technology education within the broader k-12 curriculum?***

The data indicate:

- The survey showed 23% said they had learned a great deal about issues in technology education. Another 60% said they had learned some.
- The survey showed 85% of respondents believed the meetings provided a

good forum for discussion of: "What should students know and be able to do with regard to technology?"

- Based on observation, it would appear the discussions on the structure of technology education per se, likely helped to enhance meeting participants' understanding of the field.
- Survey input of participants at meetings indicated there needed to be more attention paid in the document to the role of technology education within the broader k-12 curriculum. A review of the document's progression over time reveals that later versions of the document reflected this topic to a much greater degree.

3) ***Does the resultant document reflect:***

- ***consensus?***

  The data indicate:

  - Observations showed that the meeting process emphasized getting ideas out first, and then working toward consensus.
  - Observation data indicates the project director referred in more than one meeting to the fact that 51% consensus was being sought.
  - The structured activity of collecting reactions on each section of the document as a part of the meeting process was designed to facilitate the consensus-building process.
  - The review of the final document by key audiences indicates high consensus.

- *the range of opinions offered throughout the process?*

  The data indicate:

  - The review of document progression showed that the document changed over time as input brought forward different perspectives.
  - The project activities review and observation both show there was involvement of individuals associated with other disciplines as a deliberate effort to widen the range of perspectives.
  - The use of the World Wide Web process offers evidence of seeking opinions widely.

- *reformist and essentialist perspectives?*

  The data indicate:

  - Observation and survey data showed that involvement at meetings where input on the document was sought was primarily that of technology education people, school and college affiliated, male, and white. However, there was an effort to involve others divergent from these descriptors, and the fact is that many of the people interested in the subject fit the description above.
  - The organizing structure of technology education per se, was an issue of discussion at the meetings -- there were no givens, all was up for debate -- indicating the openness to reformist and essentialist ideas.
  - As the versions of the document progressed over time, the examples representative of diversity increased substantially.

- ***the best thinking of the profession?***

  The data indicate:

  - The survey showed 75% of the respondents felt the document (at the time of their review) was "comprehensive in scope."
  - The survey showed 75% of the respondents felt the document (at the time of the review) was "logical."
  - The survey showed 65% of the respondents felt the document (at the time of the review) was "technically accurate."
  - The survey showed 85% of the respondents felt the document (at the time of the review) was "useful."
  - The project was initiated with an extensive review of the literature.
  - The standards development process utilized by other disciplines was researched and referred to in decision-making for the project.
  - The review of the final document by key audiences indicates wide agreement with the document contents.

4) ***Has the project accomplished what it set out to do, in the manner specified in the original plan?***

The data indicate:

- The process was followed, the activities were accomplished, the document was completed, albeit late and with an approved extension.
- Input collected as the project was in progress was incorporated and reflected as changes in the document.

5) *To what extent has the project validated the need for further work in standards development for technology education?*

The data indicate:

- The survey showed 100% of the respondents agreed on the need for further work on standards for technology education.
- Observation was that participants at meetings were very interested in having standards in place.
- The individual interviewed in-depth believed there is a need for standards, although she is also aware of some of the limitations standards can bring.
- There was no evidence that anyone felt standards should not be pursued or that this precursor effort was not helpful to that ultimate goal.

CONCLUSIONS

On the basis of the information collected through this evaluation, the evaluators conclude:

- The project was undertaken with seriousness of intent. It is viewed by many in the profession to be pivotal.
- The development process for the Rationale and Structure document stressed:
  - learning from other disciplines as to effective processes;
  - solicitation of input through multiple means;
  - involvement of many people representing a range of perspectives;
  - a structured process to facilitate consensus-building; and
  - refinement of the document to reflect the input gathered.
- There is wide agreement on the need for standards for technology education.
- The discussions about technology education which have taken place throughout this project have been thoughtful and important ones. These discussions have likely been very important to technology education as it continues its evolvement as a field of study/discipline. In fact, the Technology for All Americans Project may have been critical in elevating technology education to the next step of its development.
- The project staff have been hard-working, careful, and have held to high standards. They have made appropriate adjustments according to feedback as the project progressed.
- The final document is interesting and well written. It addresses the important

points in a logical fashion and is targeted to reach the key audiences.

The Technology for All Americans Project, Phase I has made use of an effective process and has achieved its primary goals. The final document, **Technology for All Americans: A Rationale and Structure for the Study of Technology**, should provide a sound foundation for the future development of technology education standards.

APPENDICES

SURVEY INSTRUMENTATION

TECHNOLOGY FOR ALL AMERICANS PROJECT

Marking Instructions

- **Use only black lead pencil**
- **Make heavy black marks that fill the oval**
- **Erase cleanly any answer you want to change**
- **Make no stray marks of any kind**

CORRECT MARK ● INCORRECT MARKS ⊘ ⊗ ⊖ ⊙

Occupation ★ ★ ★ ★ ★ ★ ★ ★ ★

○ Teacher *(specify below)*

- ○ Pre-school/Kindergarten
- ○ Elementary
- ○ Middle level
- ○ Senior High School
- ○ 4-year College/University
- ○ 2-year College
- ○ Other

○ Administrator *(specify below)*

- ○ Curriculum Specialist
- ○ Principal
- ○ Superintendent
- ○ Other central office
- ○ Education Association
- ○ Other

○ Student

○ Non-Academic Affiliate *(specify below)*

- ○ Trade Association
- ○ Governmental Agency
- ○ Business/Industry
- ○ Parent
- ○ Other

My Primary Interest in Education is ★ ★ ★ ★

- ○ Science
- ○ Mathematics
- ○ Humanities
- ○ Technology
- ○ Vocational
- ○ Engineering
- ○ Other

Gender ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

○ Female ○ Male

Ethnicity ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

- ○ African American
- ○ Caucasian
- ○ Latino/Hispanic
- ○ Native American
- ○ Asian/Pacific Islander
- ○ Other

Age ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

- ○ 18-25
- ○ 26-35
- ○ 36-45
- ○ 46-55
- ○ over 55

Location ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

(NASA meetings)

- ○ Cape Canaveral, FL
- ○ Hampton, VA
- ○ Houston, TX
- ○ Pasadena, CA
- ○ Moffett Field, CA
- ○ Cleveland, OH
- ○ Greenbelt, MD

(Other meetings)

- ○ Virginia
- ○ Wisconsin
- ○ Georgia
- ○ Connecticut
- ○ Maryland
- ○ Pennsylvania
- ○ Colorado
- ○ Illinois
- ○ Michigan
- ○ Massachusetts
- ○ New Hampshire

Directions: ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

We need your input about the activities and materials that you reviewed today. Respond to the following questions (use a lead pencil only): No names, please.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

1. **Do you think you understand what the "Technology for All Americans Project" is all about?**
   - ○ Yes
   - ○ Somewhat
   - ○ No
2. **To what extent did you feel comfortable offering your opinions at this meeting?**
   - ○ Very Comfortable
   - ○ Somewhat Comfortable
   - ○ Uncomfortable
3. **Do you think the process of soliciting input from participants at this meeting will be effective in helping the writing team develop the "rationale and structure" for technology education?**
   - ○ Yes
   - ○ Somewhat
   - ○ No
4. **Have you learned more about technology education as a result of participating in this meeting?**
   - ○ Yes, a great deal
   - ○ Yes, some
   - ○ No, very little
5. **Do you think there is a need for technology education standards to be developed for schools?**
   - ○ Yes
   - ○ No
6. **Do you think this meeting provided a good forum for discussion of the following issue: What should students know and be able to do with regard to technology?**
   - ○ Yes
   - ○ No
7. **Do you think the document that you reviewed is:**

	Yes	No
comprehensive in scope?	○	○
logical?	○	○
technically accurate, correct?	○	○
clearly written?	○	○
useful?	○	○
acceptable to most people?	○	○
motivating and compelling?	○	○
illustrated with helpful examples?	○	○
internally consistent?	○	○
balanced?	○	○

Printed in U.S.A. Mark Reflex® by NCS MM105364:321 A2406

DIRECTIONS: Please respond to the following questions:

What do you think every American should know about technology that is not already addressed in the document? *Please indicate.*

Are there any values you think every American should hold about technology that are not addressed in the document? *Please indicate.*

Are there things that every American should be able to do with technology that are not addressed in the document? *Please indicate.*

Thank you very much!

SURVEY COMMENTS

What do you think every American should know about technology that is <u>not</u> already addressed in the document? ***Please indicate.***

The whole question of ethics needs a separate section.

It continues to change and will continue to change. The study of technology includes more than the influences of math and science. (Don't be afraid of the word "vocational.") Technology will be most evident in American's economy and careers.

Global economic elements; GNP/GDP; National Defense; Health Issues; Career Guidance

About tools; about psychomotor skills

My notes provide for several ideas.

The definition difference between science and technology.

I don't think the document addresses what every American should know about technology.

Technology is not just computers. Technology is the application of knowledge, use of resources, to meet human needs and to solve problems.

Technology is ever changing and increasing in its speed of change. Be prepared.

The primary element would be for all Americans to understand that technology should not be defined as interaction with a computer. It had a great breadth and depth to its definition.

The document does not clearly tell what is going to be taught, at what grade level, and by whom. Is technology education another name (term) for industrial arts and/or vocational education?

The need to become a lifelong learner.

The value of technology in all aspects of life should be stressed more heavily.

Technology is a human endeavor. Allude to traditional content organizers: construction, communications, transportation, manufacturing.

Impact of technological development on economic, world growth. More varied tech forms need to be represented. "Technology," tech systems not clearly defined.

Career opportunities in the 21st century. School to work component. Global competition.

System model approach to the teaching of technology. List other ways to teach technology.

What we do in technology education - methodology examples.

I think the basic framework is in the document; however, it is not clear, especially for lay people.

Should contain some "basic knowledge standards" with regard to math and science concepts.

Clearer picture of how technology can be integrated into other disciplines.

Look at the long term effects of technology (ex: environmental issues). Define systems.

Content areas such as communication, construction, etc. Not a clear definition.

Needs a different organization of content areas of technology.

There are "core technologies" which are the basis for all technology systems. Students and citizens should have knowledge and skills regarding the core technologies.

I feel that it is all there.

That technology education is essential in early childhood education classrooms K-5 and interdisciplinary in nature at all levels.

The core technologies:	Mechanical	Fluid
	Structural	Materials
	Electrical	Bio
	Electronic	Optical
	Thermal	

1. Technology should be defined as a process.
2. Explain the importance of technology and the economy.
3. Need for citizens to be technologically literate to stay competitive on a global scale.

How, with some effort, they may become a "player," able to participate (even at a later time in life) in technical activity, use and understanding.

Technological leadership is necessary for the nation to remain a superpower.

Environmental technology decision-making.

Science, technology and societal issues (STS). $ limitations.

Comments made in draft of document.

The skills learned from technology education (as stated in the scans report) need to be emphasized.

- Critical thinking skills
- Teamwork skills
- Leadership skills
- Problem-solving skills

Focus on computer applications.

Great start! Well focused and clear.

Have pre-registration with materials mailed at least one week in advance.

Relationships among mathematics, science, technology, industry and society.
Understanding and applying the technological method of design and technology.

Technology education is not just new equipment.

Are goals intended to be open for interpretation so as to meet each school's abilities? If not, goals should be more descriptive to eliminate any possibility of misinterpretation.

Technology is "applied knowledge."

Process skills related to learning.
Treating "knowledge as a resource."

"The ramifications."

Apply knowledge. Program goal. Interdisciplinary - science, math, social, writing, reading, health.

The management of technology from concept to cradle. Birth to death. Life-cycle management. Most Americans don't think about what will happen--the aftermath of the use of technology!

Technology in itself is not inherently good or bad, but when applied with a valid risk/value assessment its overall contribution to society is positive.

What the technological process is.

More about K-12 programs. More defined and addressed audience. Clearer definition.

Less jargon.

Better review of patterns of dealing/coping with technological endeavors as citizen, voter, consumer, worker, ---.

Knowing the difference between educational/instructional technology and technology education is important--not addressed in the document. Liaison and/or collaboration with the International Society for Technology in Education standards process is essential. We should contact them, be pro-active, instead of waiting for them to contact TAA.

Relationship of technology to disciplines. What it looks like/where is the vision of teaching and learning? Content alone is not enough. Need to know how students learn and multiple instructional methods/settings.

How technology impacts their lives; using the system approach to problem-solving. I still did not feel this document addressed <u>why</u> technology should be a separate class--why it is a unique class, not a unique body of knowledge.

Technology is universal and always changing.

An accurate list of requirements that need to be taught and at what level. The document did not seem to be written for administrators and tech educators. This document did not support the technology educators that are in the field. If these staff do not like this new document, it will fail when the administrators ask about feelings of this change.

How <u>all</u> disciplines contribute to the development of technological literacy. Technology education serves as the central mechanism or means, but all disciplines contribute.

Technology's relationship to science. What is Technology Education? What does it look like in all levels of education? How is it integrated? What are the unique instructional strategies used by technology educators?

The need for everyone to be technically literate in some manner.

Systematic problem-solving strategies.

Several things--some include complete definition. Add a glossary of terms.

More modern history, needs for technology today, new technology--both tried and proposed.

Systems model: input-process-output
(feedback)
We are the practitioners of math and science.
Group dynamics, problem solvers, creative thinkers, work habits.

Identify the major concepts/competencies every American needs as a consumer/member of a technological society. Not processes but what are the technologies all students should be exposed to.

Systems model.

When they leave a K-12 program, they should feel confident they will be able to function in our fast changing world. They should have the intellectual tools needed to adapt and continually learn.

Our society is at a crossroads--people who understand and those who do not. Technology will continue to divide our society if we do not address the problem.

There are some items in the document I feel all parents should know. Maybe a small publication could be produced for schools to purchase and give to parents.

Better understanding of larger "systems" areas. Technology examples need to be more current and powerful. Maybe drop techno references--make the points by writing about kids doing technology or tech ed projects. Need a well developed framework for tech ed. What are the benefits of the tech ed experiences for kids.

Technology bodies of knowledge--bio/physical/informational. Technology systems--communication, transportation, production. Technology process--problem/process/product.
(assessment)

The document is very incomplete; the information presented is correct, however. Technology should be taught and integrated in all subject areas--defined and leadership addressed through the technology education teacher.

1. Problem-solving skills.
2. Ability to adapt to change.
3. Application of knowledge and systems.
4. Self-directed learning as much as possible.
5. Ethical behavior.

I do not believe that content was identified in this document.

"Producing" context associated with common endeavors--manufacturing, communication, etc.

1. Define technology clearly.
2. Where is it found.
3. Problem-solving and systems (systematic thinking).
4. Core knowledge and skills.

How technology education is different from science.

Its impact.

That it is not to be feared.

General content to be taught.

The content of the field.

I think the document should address more multiple entry level jobs associated with technology.

Actual content domain. Issues related to integrated technology and/versus specialized discipline within technology.

What the content is!

That technology learning is a life-long process.

More about how this relates to "every person's" life. More relevant examples. Understand the interface of technology to their lives as well as almost all entry points to jobs/careers.

Technology is a verb describing an action, a process where people use what they have and what they know to get what they need or want. Technology education offers the student an opportunity to question and change accepted methods or solutions to problems by employing critical thinking skills.

That Technology Education must start at an early age and must be a part of the person's education the rest of their life.

Levels of need to know information K-5, 6-8, 9-12, 13-16. Importance of integration of content within education.

I think that the document is completely addressed.

With recommended revisions document is okay. As is, it is deficient in completeness and continuity.

That there must be a balance of content (knowledge), methods (do) and societal implications (value) in order for technology to progress properly.

Covered well.

The long term impacts of technology on U.S. citizens as compared to other citizens of the world.

Universal concept--market by changing title of document and/or project. *Emphasis on Technology Education.

The goals were complete, with the addition of those mentioned during the discussion. May need a goal that places more emphasis on technology as a process used to solve problems.

What age to start. Instructional delivery methods.

1. Critical thinking processes to solve simple and complex problems.
2. Be aware of how technological systems affect us directly or indirectly on a daily basis.

Relation to language and language skills.

There needs to be more references to our need to keep up with technology to ensure a more satisfactory life in our communities. Career awareness and choices should also be addressed.

That technology is a way to enable humans to achieve their potential. Using technology will release people and give them freedom to achieve more.

Language/Language skills in context of technology.

There are places within the document where the "extra" verbiage takes away from the clarity.

Careers, economics of technology, consumerism.

That technology is ever changing and will impact their lives in very real ways. We need to strive toward technological literacy as a nation.

I think everything was addressed.

The role of technology education in competing in the global community.

I believe the primary focus of technology education is not what to think, rather how to think. Technology education should instill in students a systems model, helping them to

comprehend and evaluate new and emerging technologies.
Mission: To comprehend and contribute to a technological society.
Define Technology Education: Concerned with the evolution, utilization, and significance of technological processes and products. It is a comprehensive, action based, holistic, multi-disciplinary, multi-sensory, hands on educational program. It utilizes a systems approach to give the student a model in which to evaluate new and emerging technology's impacts on society and the environment.

All disciplines of education should be introduced to Technology Education in order to get a clear understanding of what the document is trying to accomplish.

That all Americans (including adults) will need to be comfortable keeping up with technology to participate in society now and in the future.

Technological decision-making methods. Methods of assessing technology. Politics of technology and technological decision making.

The document does not address how technology is also a method for learning. Many kids "discover" themselves in technology classes.

It is dynamic and ever changing.

That problem-solving and critical thinking can be developed (beginning) at a very early age. This can and should be integrated throughout the current curriculum.

A clearer statement describing "technology" and "technological literacy."

Real standards, student and teacher outcomes.

That they (technologies) are inter-related.

Goals of Technology Education could be better stated.

How to support and expand technology experiences for students.

Are there any values you think every American should hold about technology that are not addressed in the document? ***Please indicate.***

The word values is a word of trouble in many areas.

Cannot teach values.

The entire issue of values must be dealt with carefully. This needs to be discussed in depth as the document is developed.

Technology is not to be feared but used.

To value understanding about technology.

There is a need to develop a "positive" attitude toward technology in order that we can have generations of young people willing and interested in working with technology.

What we need to show is how all levels of students need training in all levels of technology. We need to stress that citizens who are plumbers, machinists, carpenters, etc. are not second class individuals.

Teaching of values is dangerous in today's society. Values which people learn on their own through Technology Education are fine but it seems like this document is trying to push values.

Apply ethical and legal standards in planning, using and evaluating technology.
Evaluate the societal and environmental impacts of technology and forecast alternative uses and possible consequences to make informed civic, social and economic decisions.

The relationship of educational technology as it relates to technology education. The focus of technology or technological solutions because the basic understanding is not there needs to be addressed. The relationship of business, industry, etc. to the K-12 technology setting.

That technology is incorporated into every subject area. What about band, home economics, foreign languages, drama, etc...

Dealing with public perceptions about technology--enhances life? Accessible? Kids accept as way of life but do parents, decision-makers, community?

If Tech. Literacy is the equal opportunity issue of the 21st century then the document should exemplify women and minorities in its examples. Everyone must be able to find herself/himself, etc. in this document.

The ethical evaluation, judgment and action of dealing with Tech endeavors. Whether "values" should be taught, some actions are a must or we are negligent. Safety, environmental treatment, respect of others around tools, materials, and processes.

Define what Tech. Ed. is and what it is not.

A positive impact on society is desired as a result of any implemented technology. This is a social issue that must be taught at home and in school. It's not well known that once absolute standards were removed from public education in 1962 with the banning of Christian values, many adverse trends started, which continue to degrade our society.

The recycling of resources at the end of the useful life of technology.

We respond to ethical dilemmas

"The ramifications."

Technology now and then. (Cave man's use of technology started it all).

These may be inclusive in present "draft" goods. Ability to be resourceful in the use of materials, accessing and acquiring information.

Learn about past technologies.

All Americans should know that technology is the manifestation--tangible evidence--of thought process and focused activity.

Responsibility.

Benefits and risks. Using a systematic process to solve technological problems.

Importance and necessity and urgency of technology education.

Ethical, legal considerations.

It will be necessary for all citizens to be able to adapt to change. Many people will have to make some career change in their life; so the broader the base of education, the better off they will be.

Value quality.

Interdisciplinary nature expanded. Gender/multicultural emphasis.

What is a value? This is an intrinsic component of one's motivation. I think that every citizen should value the interplay of concepts and content in science, math and technology.

Issues of ethics and consequences of applications of technological advances on others, not participation in decisions regarding implementation.

It exists as the competitive edge for America's place in the world.

The difference between science and technology. The dependence of "core" subject and technology.

Yes, that it is essential to understand but not always needed to succeed. Be implemented K-12.

The importance of technology education as a core subject.

Realism.

Values not a good term.

Ethics.

Do not address values unless you want to fight many political battles. Don't use outcomes either.

Tools, materials, processes - hands-on performance objectives.

We need to stress that technology is done, not just known.

Historical values in different cultures would be nice to add.

Yes, I believe every American needs to be taught about technology education so they can develop an appreciation for the knowledge they need to learn on a continuing basis.

This type of educational curriculum is for everyone--male/female, young/old, etc.

Ethics as it relates to technology.

Language arts and more of the arts.

Impact on economic well being of nation.

They should be aware that technology can influence good and bad outcomes. Ethics awareness is critical to the influences of technology. They (we) should value the influence of technology on the economy and society.

That it is for all students.

I do not think we should teach values. I think we need to teach technology and how to go about making responsible choices.

Right of every person to have access to and instruction about the latest technologies.

That humanity is in charge of technology.

Values should be modeled, but not taught in school.

The negative impacts of technology were not addressed as much as they should have been.

Values should be taught as a goal.

Consumerism; careers; economics of technology; competitiveness; importance of learning to do.

A global perspective/appreciation to accompany a global competitiveness.
Less national myopia, more citizen of the world--it is getting smaller.

Technology should be available to all people or people will be disadvantaged.

Responsible behavior technologically.

Appreciations for the importance of systems we use daily.

Group dynamics.

Equity in terms of $ and instruction pre-k through post-secondary. Basic component of curriculum at all levels.

Production, transportation, communications should be emphasized more.

Values should not be addressed in the document.

The student should value technology and what technology is and can do.

Should know the effect of technological changes on the entire population when new

technologies are proposed and implemented.

The important of technology education as a content area. Learning to value this experience would be great. Learning how to learn about technology, work ethic development, leadership development.

They can value what technology can do but we cannot teach values.

Ethics of technology.

Ethical decisions about technology use.

We should not ID values for others!!

Need to address ethical considerations (not ethics) of technology education.

Ethical issues.

Concept of trade-offs and impacts.

It can assist and help with our lives.

I am in favor of teaching some responsibility.

Technology Education vs. Education Technology.

I don't believe the document clearly explained why Technology Education should be a part of the child's education. Technology Education for children should have been the foundation for this paper.

The modern ability to use and abuse technology equally.

Every American, after participating in a quality technology education program, should be able to value technology.

1. It is not technology which is good or bad but how human beings use technology.
2. Being technically literate will help us remain/regain world competitiveness.
3. Multicultural, gender, equity as well as socio-economic, handicapped (mental and physical) issues.

Values people should have include how it affects their socio-economic structure.

Speed of change, conservation of resources, multicultural/gender equity.

The document needs to be a voice/advocate for all kids, all abilities--not adults talking just to adults. Examples should reflect the systems areas. Add safety related learner objective.

Technology Education could provide students with a career in their future. Technology is for all students and should be a required class for all students.

No fear. No person should feel that technology will overtake them, giving them the feeling of less value.

Stay away from values; use ethics.

Continue evaluation of current and past technological developments and use from an ethical perspective.

Get off the value definition and concentrate on legal ethics. Incorporate environmental. societal and individual.

Are there things that every American should be able to do with technology that are not addressed in the document? ***Please indicate.***

Yes, skills.

Use systems to solve problems.

More varied tech forms need to be presented.

Manipulate materials.

The standards which follow may help address what is to be done. That section needs work.

Ordinary survival will depend on technology understanding.

Environmental Technology.

Experience it and appreciate its use and what it can do on a personal level for them.

A real basic need for technology as a core area of study.

Should be able to make informative choices about the use or non-use of technology in their lives. Be implemented early K-5.

Be literate - K through life.

Some mention should be made regarding students being able to be constructive contributors to our technological society.

Citizens should be able to extract from their resources (i.e. people, information, capital, machines, etc.) to apply and adapt them to solving problems.

Deal with all technologies--biotechnology areas.

Evaluate and assess impacts/benefits.

We need to address Educational Technology as part of our content (content standards). We are the best group to use Ed. Tech to teach. They need a home; it can only help our cause.

Be self-sufficient.

Translate/assemble instructions or programming directions into accomplishments that work (e.g., set up and operate a computer or set time on a VCR).

Ethics and control of technology.

Use common work and communicative tools.

Comfort level (How to find where that might be).

Yes, work safely and efficiently.

To better their lives and improve the problems around the world.

Should be able to retrain.

Use the tools of technology--a variety of tools--to solve problems. The emphasis upon ideas and issues may appear more significant to the reader than the use of tools.

Students are held back from technology because of three facts:

1. Cost of supply equipment to classrooms that change every 2 years.
2. Because technology is not required by colleges, we are placed on a lower plane or status.
3. Parents want good jobs for their kids and think that a 4-year college is the answer when actually laboring workers make a good living.

Use and transfer technological knowledge and skills for life roles (family member, citizen, worker, consumer). Employ a systematic approach to technological solutions by using resources and processes to create, maintain and improve products, systems and environments.

Information transfer, acquiring, using, etc.

Very little is stated in the document about what to do <u>with</u> technology. That's what I would like to see as a math educator.

General Comment: The document is not inclusive for gender equity or minority contributions.

They should be technologically literate and be able to adapt to new technologies as they are introduced.

I don't think the document clearly states what every American should be able to do with technology. There needs to be a goal (1) followed by a list of specific objectives.

Use tools to interact with technological devices.

Be familiar with various technologies and be able to comfortably use any given technology.

Able to work with others. Be able to learn how to learn.

What Americans should be able to do are not addressed at all in the document.

Use of motor skills. Use of tools used in solving problems.

Gain transitional skills for work and life.

More emphasis on the application to show that they did learn.

I strongly believe that the document needs relevancy. The "fields" need to show job choices.

Consumers; careers.

Electronic communication.

What about concepts of word processing, spreadsheets, etc.

All Americans should possess the strong critical thinking skills required to solve technology. This aspect includes the basic skills required to use tools and equipment.

Plan for future technology education.

Survive and thrive in the American society.

Design and think for themselves.

Relate the need for our citizens to become technologically literate in relevant ways for the ordinary citizen.

Access it and integrate it.

To better meet their needs and wants.

Become a wise consumer of technology--more emphasis is needed.

They should be able to solve problems cooperatively in a real life scenario.

Learn the emphasis on critical thinking to solve daily problems.

Identify content of the discipline.

I found that capacity to grow technology literacy-wise was not addressed. Most people are capable but aren't we capacity building.

Yes, the what to do was not fully explained.

Yes. Skills (psychomotor domain) were barely touched on and this hands-on aspect must be addressed.

Every American needs to make ethical decisions about how technology should be used.

Yes, the hands-on aspects are lacking.

Endless opportunities--multiple intelligence theory to be applied.

Technology Education is application based education; yet the document stays away from presenting Tech Ed as the delivery system for hands-on learning.

Plan, implement, etc. key things that come to mind.

Access information; apply information.

All Americans should understand themselves and their individual ability for using technology.

Adaptiveness/willingness to accept change.

Please don't rush to finish document early (i.e. ITEA). Take the time for the strongest political advocate statement for Technology Education.

They should feel positive about Technology Education.

Every person should be able to function and not be at a disadvantage to other people or other groups of people.

Every American should understand and be able to use common technological devices, current at that time.

We live in a global society. What is done in your small community impacts the world. Futures forecasting.

REVIEW AND COMMENT BY KEY AUDIENCES

Technology for All Americans:
A Rationale and Structure for the Study of Technology
Review and Comment Forms (Final Draft)
62 Total (Recipients of Final Draft)
48 Total (All Respondents)
80% Responded

1. The Preface communicates the introductory remarks and overview of the document well.

23	Strongly Agree	54.76 %
18	Agree	42.86 %
1	Disagree	2.38 %
0	Strongly Disagree	0.00 %

42		

2. The Power and the Promise of Technology (Part I) of the document presents a valid rationale for technology, as well as a need for technological literacy.

17	Strongly Agree	41.46 %
19	Agree	46.34 %
4	Disagree	9.76 %
1	Strongly Disagree	2.44 %

41		

3. The Structure for the Study of Technology (Part II) provides a clear framework for the universals of technology.

13	Strongly Agree	30.95 %
22	Agree	52.38 %
6	Disagree	14.29 %
1	Strongly Disagree	2.38 %

42		

4. Teaching Technology (Part III) presents an appropriate overview for what technology education programs at the elementary, middle, and high school levels should be like.

19	Strongly Agree	46.34 %
19	Agree	46.34 %
3	Disagree	7.32 %
0	Strongly Disagree	0.00 %

41		

Note: Not all reviewers answered every question.

5. Taking Action provides a broad description of the proposed future standards for technology education, as well as an effective call to action.

17	Strongly Agree	51.61 %
16	Agree	45.16 %
1	Disagree	3.23 %
0	Strongly Disagree	0.00 %
34		

6. The References and Resources and the Appendices are appropriate.

20	Strongly Agree	50.00 %
16	Agree	47.06 %
1	Disagree	2.94 %
0	Strongly Disagree	0.00 %
37		

7. The overall document is designed well and the proposed photographs and illustrations are appropriate for the content.

16	Strongly Agree	40.00 %
17	Agree	56.67 %
1	Disagree	3.33 %
0	Strongly Disagree	0.00 %
34		

8. What is your reaction to the overall substance of the document *Technology for All Americans: A Rationale and Structure for the Study of Technology*?

23	Strongly Support	62.86 %
16	Support	34.29 %
1	Oppose	2.86 %
0	Strongly Oppose	0.00 %
40		

Note: Not all reviewers answered every question.

FINAL REPORT

Technology Education Professional Enhancement Project
NASA Grant No. NCCW-0064
October 1, 1994 to September 30, 1996

To:

National Aeronautics and Space Administration
Office of Human Resources and Education
Code FE
300 E Street, S.W.
Washington, DC 20546
Attention: Ms. Pamela L. Mountjoy
Educational Resources
(202) 358-1538 / Fax (202) 358-3048

From:

International Technology Education Association
1914 Association Drive
Reston, VA 20191-1539
Contact: Thomas A. Hughes, Jr., Director of Development
(804) 559-4226 / Fax (804) 559-4226

PROJECT SUMMARY

The International Technology Education Association (ITEA) received NASA grant NCCW-0064, Technology Education Professional Enhancement Project, for a period of approximately twenty-four (24) months beginning October 1, 1994. A project extension was allowed through November 30, 1996 without extending the amount of approved funding. The intent of this work was to continue a cooperative endeavor between NASA and ITEA that strengthens an integrative curriculum of mathematics, science, and technology and increases the effectiveness of educators to empower students to understand, apply, and assess technology. Two goals guided this project:

GOAL I. INTEGRATIVE AEROSPACE MATERIALS
Use the integrative field of aerospace technology to enhance the content and instruction delivered by math, science, and technology teachers through the development of a new publication entitled *NASA Technology Today*.

GOAL II. RATIONALE AND STRUCTURE FOR TECHNOLOGY EDUCATION
Research and develop a rationale and structure for the study of technology, which establishes the foundation for developing technology education standards and programs of the future.

GOAL I. INTEGRATIVE AEROSPACE MATERIALS

The project initiated a publication through an agreement between ITEA, Association Business Publications (ABP) (publishers of *NASA Tech Briefs*) and in cooperation with NASA, to share the excitement, adventure, and knowledge of NASA's work with educators for use in their classrooms and with parents for use at home. *NASA Technology Today* was designed to help educators stay abreast of the latest happenings in the aerospace industry,

scientific, and technological developments (communicated in layperson's terms) and the wealth of resources available for the school classroom and laboratory.

Two editions of *NASA Technology Today* were prepared by ITEA and transmitted to ABP to produce copy for the Government Printing Office, which printed and returned to ABP for dissemination with *NASA Tech Briefs* to 210,000 subscribers September, 1995 and March, 1996. Copies were also disseminated through the national conferences of the National Science Teachers Association, the National Council of Teachers of Mathematics, and ITEA.

The inaugural issue, September. 1995, featured 16-pages of content with six articles: (1) Hubble Space Telescope, (2) International Space Station, (3) Dante II, (4) NASA's Mission to Planet Earth, (5) Spacelink, and (6) miscellaneous technical information.

The second issue, March, 1996, included the following feature articles: (1) The Next Generation of Supersonic Airliners, (2) Traveling in the Information Highway's Fast Lane, (3) Learning On-Line: Information at Your Fingertips, (4) GAS Gets Schoolwork Off the Ground, (5) Becoming an Astronaut, (6) They Came From Space: Down-to-Earth Products of NASA R&D, (7) What's The Reason for . . ., and (8) Techbits.

Response to *NASA Technology Today* has been very positive. Requests for additional copies of each issue overwhelmed the supply. Assorted readers, including teachers, administrators of various NASA Centers, NASA contractors, and the general public, responded with commendations for the content and presentation. Receiving information about highly technical and sophisticated developments so that teachers could draw relationships between school studies and the sophistication of NASA technology appeared to be valued and appreciated.

ABP and ITEA believe this new resource was a success and will be valued by educators in the future. Thus, an agreement has been formed between them to produce the publication as a business venture henceforth. Consequently, the third issue was prepared on this basis and released as the Fall, 1996 edition (September, 1996). Content is being prepared so that a production schedule can be sustained with six issues per year. Subscribers, advertisers, and subscription underwriters are currently being sought.

GOAL II. RATIONALE AND STRUCTURE FOR TECHNOLOGY EDUCATION

We are surrounded by the concepts, processes and products of technological innovation. Technological literacy is considered critical to the future of our country's businesses, government and quality of life. The need for a technologically literate citizenry grows stronger each year.

To meet this need, the National Aeronautics and Space Administration and the National Science Foundation funded Goal II to develop a rationale and structure for technology education. This effort was spearheaded by ITEA and is entitled "Technology for All Americans." The ultimate goal was to offer those who are interested in technology education as an essential core subject, a clear vision for what it means to be technologically literate, how this literacy can be achieved at a national level, and why it is important for our nation.

The Technology for All Americans Project set out to achieve this goal by establishing a National Commission to serve in a advisory capacity to the project staff. The 22-member Commission functioned independently of both the project and ITEA. The Commission was composed of persons who were especially aware of the need for a technologically literate society. Members represented the fields of engineering, science, mathematics, the humanities, education, government, professional associations, and industry. They served as a vital resource of experts who were knowledgeable in technology and its interface with science, mathematics, engineering, and education.

A six member writing team was formed from the National Commission. The writing team represented a wealth of knowledge, extensive background, and a unique diversity that played an important role in the *Technology for All Americans: A Rationale and Structure for the Study of Technology* (the R&S Document), the Project's final product.

The R&S Document, in draft form, went through a dynamic process as a result of a very structured consensus process. It underwent the scrutiny of over 500 reviewers inside and outside the profession of technology education. During the initial review process, that took place during the month of August 1995, the draft document was mailed to numerous professionals. These professionals were selected via a nomination process. Each state supervisor for technology education and president of state associations for technology education were asked to nominate mathematics, science, and technology educators from elementary through high school levels to participate in a series of consensus building workshops. These workshops were hosted by the following NASA field centers:

Consensus Building Workshops at NASA Centers on First Draft Conducted by the Technology for All Americans Project (August, 1995)

NASA Center	Location
Ames Research Center	Moffett Field, California
Goddard Space Flight Center	Greenbelt, Maryland
Jet Propulsion Laboratory	Pasadena, California
Johnson Space Center	Houston, Texas
Langley Research Center	Hampton, Virginia
Lewis Research Center	Cleveland, Ohio
Kennedy Space Center	Cape Canaveral, Florida

The draft document was disseminated to the participants prior to the consensus building workshop. They were asked to review the draft document and respond to several prepared questions, as well as provide comments directly on their copy of the draft. At the workshops, participants were divided into heterogeneous groups that represented the interest groups of those involved (i.e., elementary, middle school, high school, mathematics, science, technology). These small groups were then asked to respond to prepared questions as a group and come to consensus on the content of the draft document. Generating input and reactions from the field were very valuable during the consensus process. Perspectives were shared that had not been discussed in prior writing team meetings. Ideas for improving the draft document were generated from the group synergism, and regional philosophies or viewpoints were acknowledged.

This input was analyzed to determine the needed changes for its content. Changes were made to reflect the data from the summer workshops. In addition, these changes were "tried out" with groups throughout the fall at state and regional conferences. The project staff found that by focusing on major input identified from the summer review process, they could concentrate on changes made in subsequent versions of the draft document.

Changes and revisions go hand-in-hand with the consensus process. This process continued throughout the fall until a second version of the draft document was disseminated for review in October-December, 1995. This draft of the document was disseminated to over 250 people. This group contained a large number of administrators. It was felt that an important part of the consensus process includes a "buy-in" component. In other words, if technology education is to become a core subject in our schools, then those who hold the power to enable this vision to become real must be involved in the front end of this process.

Additional efforts were made to expand the audience that reviewed this document by making it available to anyone having access to the Internet. Throughout this project, an Internet home page was maintained in an effort to disseminate timely material generated by the project. Access to the draft document became part of our home page in December 1995, and reviewers were invited to fill out a comment and review form on-line and submit it to the project for consideration prior to the final revision. The final version of this document represents the broad support and input that was provided throughout this consensus process. The final R&S Document was disseminated to 8,500 educators and key decision makers in September, 1996.

Attached is a final evaluation of Phase I of the Technology for All Americans Project and the final R&S Document.

After developing a consensus-based rationale and structure for the study of technology, the ultimate goal for the Technology for All Americans Project is to develop standards for technology education. This will include Kindergarten through twelfth grade curriculum content standards with benchmarks at 4th, 8th and 12th grade, teacher enhancement and teacher preparation standards, student assessment standards, and program standards. When these standards are developed and implemented, they should improve the quality of technology education programs in the schools in the future.